REMARKS/ARGUMENTS

Claims 1-22 are pending in this application. Claims 18-22 have been allowed. Claims 8-13 and 16-17 were indicated as allowable if rewritten in independent form. These claims have been so rewritten, and accordingly are now believed to be allowable.

The invention.

The invention allows a listener to hear two separate audio signals. Differentiation cues are added to at least one of the audio signals so that they sound different to the listener, enabling the listener to distinguish the two audio signals from each other. A number of different differentiation cues could be used, such as changing a frequency or pitch of a voice to make one higher pitched than the other, changing the amplitude to make one quieter than the other, panning, differential time delay, etc.

Begault, Patent No. 5,438,623.

The Begault patent relied on the office action is directed to a system that makes an audio signal appear to come from a particular position. One of the inputs to the system is source position information to indicate a desired virtual source location (e.g., col. 3, ll. 1-4). Begault implements a complicated Head Related Transfer Function (HRTF). HRTF spatializes or positions a sound source. This is defined in 3-D Sound for Virtual Reality and Multimedia by Durand R. Begault, 1994, pg 52:

> The Head-Related Transfer Function. The spectral filtering of a sound source before it reaches the ear drum that is caused primarily by the outer ear is termed the head-related transfer function (HRTF). The binaural HRTF (terminology for referring to both the left- and right-ear HRTFs) can be thought of as a frequency-dependent amplitude and time-delay differences that result primarily from the complex shaping of the pinnae.
>
> The folds of the pinnae cause minute time delays within a range of 0-300 microseconds (Batteau, 1968) that cause the spectral content at the eardrum to differ significantly from that of the sound source, if it were measured, for instance, by an omni directional microphone. ...

[The "pinnea" are the flesh and cartilage of our ears. They alter sound depending on the direction from which it comes.]

The present application describes systems like Begault and distinguishes them in the body of the application. E.g., see page 6, ll. 10-19.

Claim 1.

Claim 1 has been amended to add two additional elements. First, claim 1 now requires that the differentiation cue provide sufficient differentiation to allow a listener to more easily distinguish said first and second audio signals than without said differentiation cue. In other words, in an embodiment where special cues are used (rather than volume, pitch, etc.), instead of placing the sounds at virtual locations that may or may not be close to each other, as in Begault, claim 1 now requires that the sounds be placed as sufficiently distant virtual positions so that a listener can distinguish them readily. Begault applies no such requirement, and may end up with sounds right next to each other, and thus more difficult to distinguish.

Claim 1 has also been amended to set forth that the cues are added independent of any positional information corresponding to the audio signals. As noted above, Begault has a system that places sounds at a virtual location corresponding to "source positional information" that is provided to it (col. 3, ll. 2-3). This information is stored in a PROM (col. 3, l. 1). Thus, claim 1 now also distinguishes Begault by providing differentiation cues regardless of any positional information. Those differentiation cues can be of multiple types, such as pitch or amplitude, etc. In the one instance where those differentiation cues are spatial, as in Begault, the present invention distinguishes Begault by not placing those cues based on positional information received. Rather, the present invention places those sounds in virtual positions in the spatial cue embodiment according to the previously described element of claim 1, such that they appear to originate from unique and listener distinguishable locations.

It would not be obvious to modify Begault to produce the present invention. Begault offers no suggestion that one or both voices can be understood better when both speak at once by selecting the positioning difference appropriately. Instead, Begault wants the location of the sound sources to be perceived regardless of whether they can be discriminated by the listener

sufficiently to actually hear the different messages communicated. At col. 2, l. 6, Begault does mention intelligibility in passing, but here it implies that ambient noise is the source of distraction, not simultaneous speech or other audio where a listener needs to hear both. In one example, Begault could be used for a sound source in a 3-D simulation. Those sounds could be blasts from a ray gun, for example. There is no need to be able to discriminate between voice information from two sources when those two position sources are simply the sounds of blasts from guns in a video game. Thus, there is no need to modify Begault, and thus no motivation for changing Begault to arrive at the present invention.

Accordingly, in view of the amendments to claim 1 and the above discussion, it is submitted that claim 1 is now in condition for allowance.

Claims 7, 14, and 15.

Independent claims 7, 14 and 15 have been amended similarly to claim 1, and accordingly are believed allowable for the same reasons as set forth above.

Dependent claims.

The dependent claims add additional features which further distinguish Begault. For example, claim 5 sets forth that the channel separation is an amplitude difference between the left and right audio signals. Changing the amplitude of the two signal sources is a very simple way to distinguish between them that is easily implemented. In contrast, Begault uses spatialization and a complex HRTF to virtually position sounds. The office action refers to the differences in location inherently having an amplitude difference in Begault. However, it is submitted that claim 5 sets forth using an amplitude difference as the differentiation cue, not a spatial difference. Clearly, adding an amplitude difference is a very simple process which is much easier to implement and has many advantages over a spatial differentiation cue for the purpose of the present invention. Just as clearly, an amplitude difference does not serve the purpose of the Begault patent. It is believed that any concern that the claim language would read on the incidental amplitude variation of Begault has been corrected by the amendments to claim 1, discussed above.

Conclusion.

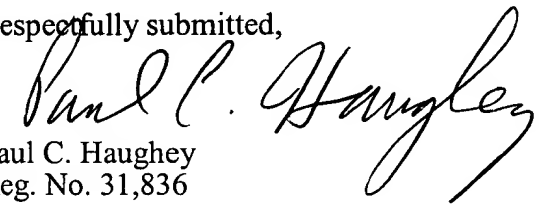
Thus, as discussed above, the claims as amended are believed to not be anticipated by or obvious in view of the prior art. The inventor, Scott Wedge, makes the non-obviousness point with a good example:

> This [invention] is not obvious. If it were, it would be used. For example, as I understand it, airline pilots are required by the FAA to wear headsets with boom microphones so that their voices can be captured by cockpit voice recorders. The planes are equipped with intercoms so that the pilot and co-pilot's voices are audible in the headsets, along with tower transmissions. I have read that they often re-position the headset so that only one ear is covered. This way, they are able to distinguish the voice of their co-pilot from other voices. Clearly, if Boeing, when they were designing their latest multi-multi-million dollar airplanes knew what I am teaching, they would not have their pilots flying with their headsets half off.

The above amendments and remarks are believed to put this application in condition for allowance. If the Examiner disagrees, the undersigned respectfully requests a telephone interview prior to the issuance of a final office action.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 650-326-2400.

Respectfully submitted,



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